STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
MECH 350 – Quality Improvement

Created by: Daniel Miller

Updated by:

Canino School of Engineering Technology

Department: Mechanical & Energy Technologies

Semester/Year: Fall 2018

A. **TITLE**: Quality Improvement

B. **COURSE NUMBER:** MECH 350

C. **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

 # Credit Hours: 3
 # Lecture Hours: 2 **per week**
 # Lab Hours: **per week**
Other: (1) two-hour recitation **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY: None:** ☒ **Yes:** GER
***If course satisfies more than one*:** GER

F. **SEMESTER(S) OFFERED: Fall** ☒ **Spring** ☐ **Fall & Spring** ☐

G. **COURSE DESCRIPTION:**

This course examines statistical concepts related to quality control and improvement. Additional topics include theory, construction, and interpretation of control charts in an industrial manufacturing environment. Probability as it relates to acceptance sampling and ISO 9000 quality standards will be reviewed.

H. **PRE-REQUISITES: None** ☐ **Yes** ☒ **If yes, list below:**

45 earned credits

CO-REQUISITES: None ☒ **Yes** ☐ **If yes, list below:**

I. STUDENT LEARNING OUTCOMES: (*see key below*)

By the end of this course, the student will be able to:

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
1. Collect process data and calculate, interpret and apply various types of control charts to a manufacturing process.			5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
2. Formulate and apply quality control techniques to a manufacturing process.			5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
3. Integrate an understanding of basic statistics and probability with the use of Statistical Process Control tools to ensure reliability.			5-Ind, Prof, Disc, Know Skills ISLO ISLO	Subsets Subsets Subsets Subsets
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KEY	**Institutional Student Learning Outcomes [ISLO 1 – 5]**
ISLO #	**ISLO & Subsets**
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

*Include program objectives if applicable. Please consult with Program Coordinator

J. APPLIED LEARNING COMPONENT: Yes ☒ No ☐

If YES, select one or more of the following categories:

- ☒ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning !
- ☐ Community Service
- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship (program, class, project)

K. TEXTS:

Besterfield, Dale H., Quality Improvement, Prentice Hall, 9th Edition, 2013.

L. REFERENCES:

Griffith, Gary K., The Quality Technician's Handbook, Prentice Hall, 2000.

W.J. Latzko and David M. Saunders, Four Days with Dr. Deming, Addison-Wesley, 1995.

James R. Evans and William M Lindsay, "The Management and Control of Quality, 3rd Edition, West Publishing Company 1996.

M. EQUIPMENT: None ☐ **Needed:** Technical Enhanced Classroom & computer lab

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Homework, quizzes, exams, projects

P. DETAILED COURSE OUTLINE:

I. Quality Improvement & Problem Solving Tools & Techniques
- **A. Seven phases of the problem-solving method**
- **B. Different types of quality improvement/problem solving tools & techniques.**
- **C. Differences between qualitative and quantitative tools.**
- **D. - When in the quality improvement / problem solving process to use each tool or technique and why.**
- **E. - Elements and Applications of Six-sigma, Quality Function Deployment, Failure Mode Analysis, Toyota Production System and Lean Manufacturing.**

II. Cost of Quality
- **A. - Traditional cost concept model and the application of quality principles on - evaluating cost. -**
- **B. Origin of quality cost measurement.**

C. - Know the three levels of quality cost.
D. - Impact of poor quality on overall organizational effectiveness.
E. - Examples of techniques available to reduce or enhance the cost of quality.
F. - Elements of an effective quality cost improvement system.
G. - Advantages and limitations of a quality cost system.
H. - Essential elements of "The Optimal Quality Cost Model" and the "Taguchi Loss Function."

III. Fundamentals of Statistics
A. - Elements of the two major factors that directly impact a process' ability to meet customer expectations—variation (precision) and accuracy.
B. - Relationship between variation (precision) & accuracy.
C. - How statistical process control (SPC) can assist in process improvement.
D. - Differences between common and special causes of variation.
E. - Difference between a population and a sample.
F. - How to construct a "grouped data" histogram.
G. - Different characteristics of frequency distributions.
H. - Key variables and measurements required to establish a basic SPC system.
I. - Observations statistical processes and report the results using SPC tools.
J. - Understanding the SPC feedback loop.

IV. Probability
A. - Calculation of the probability of certain events happening based on the 7 Probability theorems. -

V. Measurement Systems Analysis (MSA)
A. - Components that make up the total variation in a measurement system.
B. - Objective and strategy of a MSA
C. - Meaning of precision, accuracy and stability
D. - Two methods of performing a MSA
E. - Set up a Gage Repeatability and Reproducibility (R&R) study
F. - Difference between repeatability and reproducibility
G. - Calculation of %R&R
H. - Guidelines are for acceptance of %R&R

VI. Control Charts
A. - Why inspection is not 100% effective
B. - Function of Control Charts in an SPC system
C. - Types of risks associated with Control Charts.
D. - Relationship between specification and control when setting Control Chart limits.
E. - Process of data collection for SPC systems.
F. - Special patterns developed by Control Charts.
G. - How data of the process determine which type of Control Chart to use.
H. - Differences between XBAR–R and np Control Charts.
I. - Development and interpretation of the results of Control Charts.
J. - Calculation the process capability for a process that is in statistical control

VII. Sampling
A. - Definition of sampling.
B. - Advantages and disadvantages of sampling.
C. - Precautions required when entering into the sampling process.
D. - The formula for determining sampling alternatives.

E. The key terms involved in the sampling process.
F. The application of the various types of sampling plans.
G. The importance of randomness on the sampling process.
H. The elements of the Operating Characteristic Curve.
I. The characteristics of an effective sampling plan.

VIII. Reliability
A. Key elements of reliability.
B. The reliability design process.
C. Factors involved in reliability design.
D. Impact of management control on reliability.
E. Uses and impacts of series and parallel reliability plans.
F. Failure rate analysis.

IX. ISO 9000
A. Elements of the ISO 9000 standard & the importance of each.
B. Levels of documentation required of an ISO 9000 registered system.

Q. <u>LABORATORY OUTLINE</u>: None ☐ Yes ☒

I. Library Research (Research a current application of a quality control topic)
II. Statistics : Die Rolling and Sampling
III. Variation Experiment
IV. Control Charts and Sampling
V. Control of a CNC Process: Pins
VI. Acceptance Sampling
VII. Gage R&R
VIII. Design of Experiments: Full Factorial Designs
IX. Reliability